भारतीय मानक **IS 18139 (Part 3) : 2023**

Indian Standard

औद्योगिक स्क्रीन — विशिष्टि

भाग 3 छिद्रित प्लेट स्क्रीन

Industrial Screen — Specification

Part 3 Perforated Plate Screen

ICS 73.120

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July 2023 **Price Group 8**

Sieves, Sieving and Other Sizing Methods Sectional Committee, CED 55

FOREWORD

This Indian Standard (Part 3) was adopted by the Bureau of Indian Standards, after the draft finalized by the Sieves, Sieving and Other Sizing Methods Sectional Committee had been approved by the Civil Engineering Division Council.

Industrial screens are used in different activities in various industries for screening purposes including for separation or grading of particles. According to the nature of the process and required percentage opening area, industrial screens can be manufactured in the form of woven wire cloth, wire screen or perforated plate screen. A required percentage opening can be achieved with the various combinations of wire diameter/plate thickness, type of weave/shape of opening and pitch (in plates). The materials of wire and plate can be selected as per the process requirements.

The sizes within each series follow a geometric progression. Therefore, each size of a series differs from the successive size by a constant percentage. Apart from the omission of a few unusual values in the range of the very small sizes, the ratios of the successive sizes are as follows:

Series from IS 1076 (*Part* 1)	*Ratio*
R 10	1.25
R 20	1.12
R 40	1.06

This standard has been brought out in the following parts:

Part 1 Woven wire cloth screen
Part 2 Wire screen
Part 3 Perforated plate screen

The woven wire cloth screen is manufactured by weaving of wire; wire screen is manufactured by pre-crimping or welding of wire; and perforated plate screen is manufactured by perforation in plate.

This standard (Part 3) covers requirements of industrial screens manufactured by perforation in plate. The nominal sizes of openings specified in this Standard are taken from the R 10, R 20 and R 40 series of preferred numbers in accordance with IS 1076 (Part 1) : 1985/ISO 3 : 1973 'Preferred numbers: Part 1 Series of preferred numbers' and from the R 10, R 20 and R 40 series of rounded values in accordance with IS 1076 (Part 3) : 1985/ ISO 497 : 1973 'Preferred numbers: Part 3 Guide to the choice of series of preferred numbers and of series containing more rounded values of preferred numbers (*second revision*)'.

In the formulation of this standard due weightage has been given to international co-ordination among the standards and practices prevailing in different countries in addition to relating it to the practices in the field in this country. This has been met by deriving assistance from the following publications:

ISO No.	*Title*
ISO 2194 : 1991	Industrial screens — Woven wire cloth, perforated plate and electroformed sheet — Designation and nominal sizes of openings
ISO 7805 (Part 1) : 1984	Industrial plate screens — Part 1: Thickness of 3 mm and above
ISO 7805 (Part 2) : 1987	Industrial plate screens — Part 2: Thickness below 3 mm
ISO 10630 : 1994	Industrial plate screens — Specifications and test methods

The composition of the Committee responsible for the formulation of this standard is given in Annex C.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

INDUSTRIAL SCREEN — SPECIFICATION
PART 3 PERFORATED PLATE SCREEN

1 SCOPE

This standard lays down the requirements regarding material, dimensions, construction and finish of industrial perforated plate screen. It applies to industrial perforated plate screen with nominal aperture size from 1 mm up to 125 mm for round holes and 4 mm up to 125 mm for square holes.

2 REFERENCES

The standards given below contain provisions, which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of these standard:

IS No.	*Title*
IS 1076	Preferred numbers:
(Part 1) : 1985/ISO 3 : 1973	Series of preferred numbers
(Part 3) : 1985/ISO 497 : 1973	Guide to the choice of series of preferred numbers and of series containing more rounded values of preferred numbers (*second revision*)
IS 5742 : 2021	Glossary of terms relating to industrial screen and screening (*first revision*)

3 TERMS AND DEFINITIONS

For the purpose of this standard, the definitions given in IS 5742 and the definition given below shall apply.

3.1 Bridge Width or Bar — Distance between the nearest edges of two adjacent holes in a perforated plate.

3.2 Coil — Flat rolled sheet for the manufacture of perforated metal plate, the edges of which are allowed to deform freely during rolling and which immediately after the final rolling pass is wound into regular superimposed laps.

3.3 Feed Direction — Direction in which a plate or sheet was fed through the perforating press.

3.4 Hole Size or Aperture Size — Diameter of a round hole or distance between opposite sides of a square hole of a perforated metal plate.

3.5 Margin — Distance between the outside edges of the outside rows of holes and the edges of a perforated plate.

3.6 Percentage Open Area — Ratio, expressed as a percentage, of the total area of the holes to the total area of the perforated part of the plate (excluding any non-perforated part).

3.7 Perforated Plate — Screening surface consists of a plate with uniform holes in symmetrical arrangement. The holes may be square, slotted, circular or of other regular geometrical shape.

3.8 Pitch — Distance between corresponding points of two adjacent holes in a perforated plate.

3.9 Plate — Flat rolled material for the manufacture of perforated metal plate, 3 mm to 12.5 mm thick, the edges of which are allowed to deform freely during rolling, supplied in flat form and generally in rectangular shape, but also in any other shape according to a design sketch.

3.10 Plate Thickness — Thickness of the plate before perforation.

3.11 Punch Side — Surface of a perforated plate in which the punch entered.

3.12 Roller Levelling — Cold mechanical operation on a perforated metal plate to promote flattening.

3.13 Sheet — Flat rolled material for the manufacture of perforated metal plate, less than 3 mm thick and the edges of which are allowed to deform freely during rolling, supplied in flat form and generally in rectangular shape, but also in any other shape according to a design sketch.

4 MANUFACTURING AND CONSTRUCTION

4.1 The plates used in the manufacture of the perforated plate screen shall be free from scale, rust, etc.

4.2 Any suitable material such as steel, bronze, brass, stainless steel, aluminium and synthetic material may be used as per relevant Indian Standards. The selection of material is done in such a way that screen material should be compatible with the process and the material to be screened and should not be detrimental to achieving desired sieving quality.

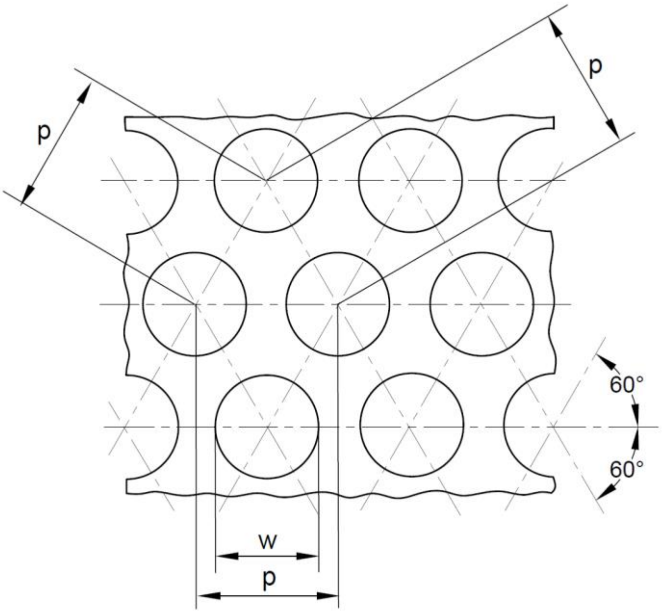
The following factors are considered during the selection of perforated plate screen material:

a) The final application of the perforated plate screen, for example, resistance to environmental corrosion, compatibility with food products, etc; and
b) Further processing, for example, suitability for shaping, welding, and surface treatment.

4.3 Arrangement of Holes

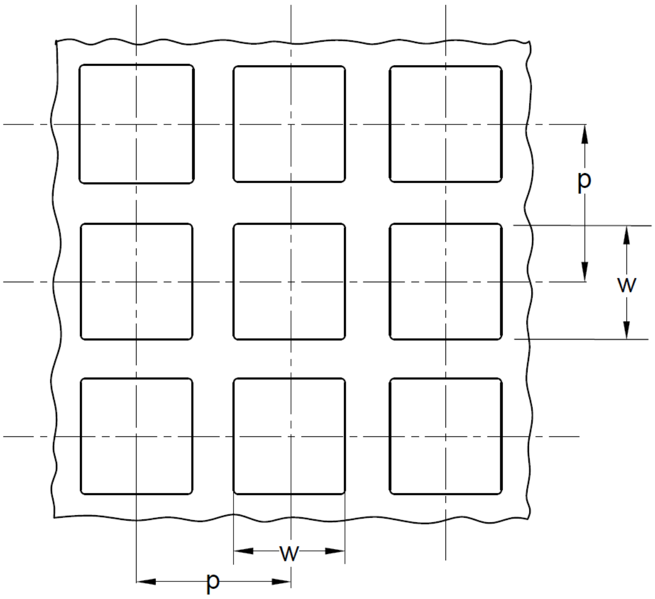
Following arrangements of holes shall be used for the manufacturing of perforated plate screens (*see* Fig. 1 to Fig. 3).

a) Round holes in a 60° staggered arrangement (T-arrangement)
b) Square holes in line arrangement (U-arrangement); and
c) Square holes in staggered at half the pitch arrangement (Z-arrangement).



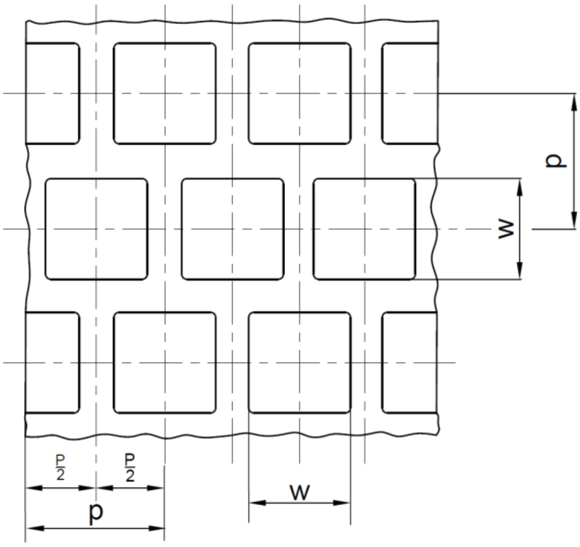
[Open area = 0.9 $(w/p)^2$]

FIG.1 ROUND HOLES IN A 60° STAGGERED ARRANGEMENT (T-ARRANGEMENT)



[Open area = $(w/p)^2$]

FIG. 2 SQUARE HOLES IN LINE ARRANGEMENT (U-ARRANGEMENT)



[Open area= $(w/p)^2$]

FIG. 3 SQUARE HOLES IN STAGGERED AT HALF THE PITCH ARRANGEMENT (Z-ARRANGEMENT)

4.4 Slight damage of the industrial perforated plates screen by mechanical action during the perforated process cannot be excluded. The irregularities caused due to the manufacturing process are given in **5.8**.

4.5 Many combinations are possible for manufacturing perforated plates screen for a size of hole. The selection should be made from those combinations which suit the products and screening methods.

5 REQUIREMENTS

5.1 Size of Hole (w)

The size of hole of round or square holes in industrial perforated plates screen shall be as per Annex A. It is recommended that the sizes from R 10 series be used whenever possible, but if a smaller size is required, it should be drawn from R 20 or R 40 as per Annex A. Testing shall be done as per Annex B.

5.1.1 *Tolerance on Average Size of Hole*

The tolerance on average size of hole shall be as per Table 1.

5.1.2 *Tolerance on Individual Size of Hole*

The tolerance on individual size of hole shall be as per Table 1.

5.2 Pitch

For a hole size, the pitch shall be calculated from the five options of pitch/hole ratio with respect to the open area given in Table 2. The calculated values shall be rounded to the nearest R 40 number in accordance with IS 1076 (Part 1). Testing shall be done as per Annex B.

5.2.1 *Tolerance on Average Pitch of Hole*

The tolerance on average pitch of hole shall be as per Table 3.

5.2.2 *Tolerance on Individual Pitch of Hole*

The tolerance on individual pitch of hole shall be as per Table 3.

Table 1 Tolerances on Size of Hole

(*Clauses* 5.1.1 *and* 5.1.2)

Sl No.	**Nominal Size of Hole,** w	**Tolerances on Size Hole**	
		Average Size of Hole	Individual Size of Hole
	mm	$\pm Y_s$ percent	$+ X_s$ percent
(1)	(2)	(3)	(4)
i)	Over 31.5 mm up to 125 mm	5	10
ii)	Over 8 mm up to 31.5 mm	6	12
iii)	Over 2.5 mm up to 8 mm	8	16
iv)	Up to 2.5 mm	10	20

Table 2 Pitch/Hole Ratios and Related Open Areas

(*Clause* 5.2)

Sl No.	**Pitch/Hole Ratio**	**Approximate Open Area**	
		Round Holes percent	Square Holes percent
	P/W		
(1)	(2)	(3)	(4)
i)	1.25	58	64
ii)	1.4	46	51
iii)	1.6	35	39
iv)	1.8	28	31
v)	2	23	25

Table 3 Tolerances on Pitch

(*Clauses* 5.2.1 *and* 5.2.2)

Sl No.	**Nominal Aperture Width**, w	**Tolerances on Pitch**	
		Average Pitch	Individual Pitch
	mm	$\pm Y_s$ percent	$+ X_s$ percent
(1)	(2)	(3)	(4)
i)	Over 31.5 mm up to 125 mm	4	8
ii)	Over 8 mm up to 31.5 mm	5	10
iii)	Over 2.5 mm up to 8 mm	6	12
iv)	Up to 2.5 mm	8	16

5.3 Bridge Width or Bar

The measured bridge width or bar shall not be less than 0.5 times of the nominal size of hole.

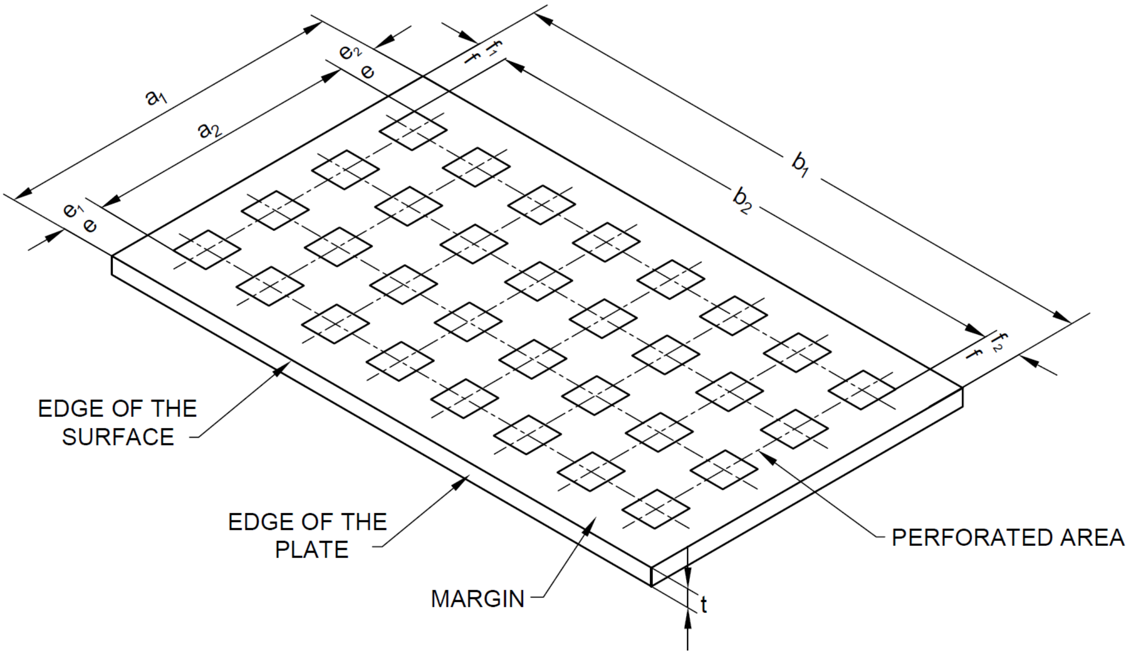
5.4 Plate Thickness (t)

The plate thickness (*see* Fig. 4) shall be less than the nominal hole size and also less than the bridge width (bar) unless otherwise agreed between the manufacturer and purchaser.

5.5 Plate Width (a_1) and Length (b_1)

5.5.1 Industrial perforated plates screen are usually supplied without cutting after perforation. The tolerance on length shall be taken as ± 10 percent and the tolerance on width shall be taken as ± 2 percent.

5.5.2 Tolerance on the cut pieces plate width, a_1 and plate length, b_1 shall be as per Table 4 (*see* Fig. 4) when tested as per Annex B.



Key

a_1 overall length of the short side of a plate (plate width)
a_2 length of the short side of the perforated area of a plate
b_1 overall length of the long side of a plate (plate length)
b_2 length of the long side of the perforated area of a plate
e width of the margins on the long sides of a plate
e_1 width of the larger e-margin, if not equal
e_2 width of the smaller e-margin, if not equal
f width of the margins at the short sides of a plate
f_1 width of the larger f-margin, if not equal
f_2 width of the smaller f-margin, if not equal
t plate thickness

FIG. 4 CHARACTERISTICS OF A PERFORATED PLATE

Table 4 Tolerances on Width and Length

(*Clause* 5.5.2)

All dimensions in millimetres.

Sl No.	Nominal Width or Length a_1 or b_1	Tolerance on a_1 or b_1 for Nominal Plate and Thickness t			
		$t \leq 3$	$3 < t \leq 5$	$5 < t \leq 10$	$10 < t \leq 12.5$
(1)	(2)	(3)	(4)	(5)	(6)
i)	$a_1 \text{ or } b_1 \leq 100$	± 0.8	± 1.1	± 1.5	± 2
ii)	$100 < a_1 \text{ or } b_1 \leq 300$	± 1.2	± 1.6	± 2	± 3
iii)	$300 < a_1 \text{ or } b_1 \leq 1\,000$	± 2	± 2.5	± 3	± 4
iv)	$1\,000 < a_1 \text{ or } b_1 \leq 2\,000$	± 3	± 4	± 5	± 6
v)	$2\,000 < a_1 \text{ or } b_1 \leq 4\,000$	± 4	± 6	± 8	± 10
vi)	$4\,000 < a_1 \text{ or } b_1$	± 5	± 8	± 10	± 12

5.6 Squareness (c)

The departure from squareness, c, generally referred to as the 'amount out-of-square', of cut industrial perforated plates screen is quantified by the orthogonal projection of a transverse edge (plate width a_1) onto a longitudinal edge (plate length b_1).

It is expressed as a percentage of a_1 (*see* Fig. 5).

$$\text{Percent out-of-square} = \frac{100c}{a_1}$$

The tolerances on squareness shall not exceed the value given in Table 5 when tested as per Annex B.

5.7 Width of Margins (e, f)

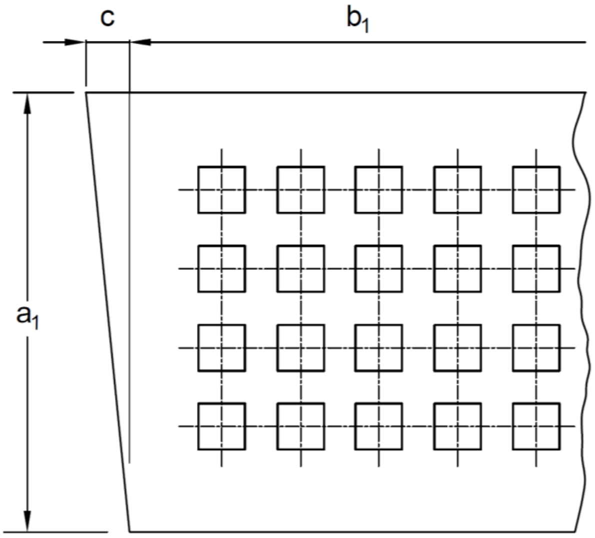
The tolerances on the width of declared margins e and shall not exceed the value given in Table 6 (*see* Fig. 4).

5.8 Irregularities Due to Manufacturing Process

The irregularities caused due to the manufacturing process in industrial perforated plate screens shall not exceed the limit given in **5.8.1** to **5.8.3**.

5.8.1 *Breakaway on Holes*

When the punch has penetrated deeply into the industrial perforated plates screen from the punch side, material will begin to tear or break away, mainly from the reverse side of the plate. The width of the breakaway w_b depends on the plate thickness t and shall not exceed the nominal hole size w by an amount of 0.15 t (*see* Fig. 6).



Key

a_1 overall length of the short side of a plate (plate width)
b_1 overall length of the long side of a plate (plate length)
c amount out-of-Square of a rectangular plate

FIG. 5 MEASUREMENT OF AMOUNT OUT-OF-SQUARE

Table 5 Tolerances on Squareness

(*Clause* 5.6)

All dimensions in millimetres.

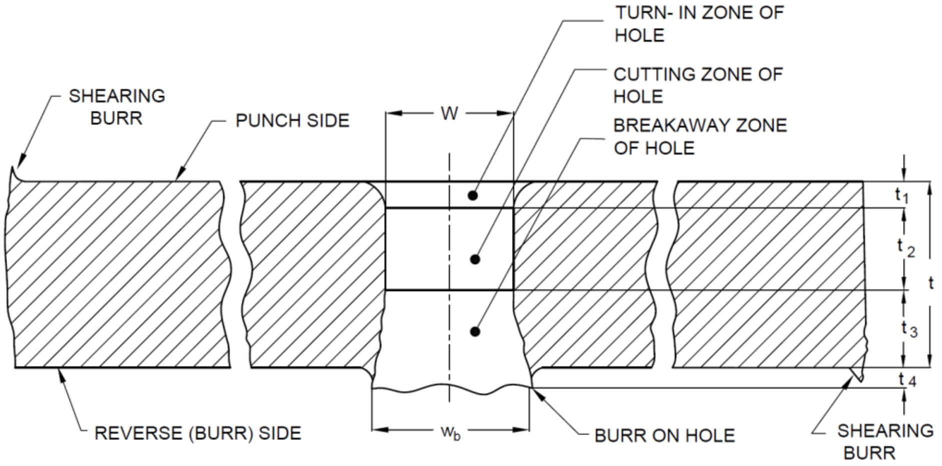
Sl No.	Nominal Plate Thickness, t mm	Tolerance on Squareness as a Percentage of a_1
(1)	(2)	(3)
i)	$t \leq 3$	0.75
ii)	$3 < t \leq 5$	1.5
iii)	$5 < t \leq 10$	3
iv)	$10 < t \leq 12.5$	5

Table 6 Tolerances on Width of Margins

(*Clause* 5.7)

All dimensions in millimetres.

Sl No.	Nominal Pitch, p	Tolerance on Width of Margins, e , f
(1)	(2)	(3)
i)	$p \leq 5$ and open area ≤ 25 percent	± 5
ii)	$p \leq 5$ and open area > 25 percent	± 10
iii)	$5 < p \leq 20$	± 10
iv)	$20 < p$	± 0.5 p



Key

t_1 height of turn-in zone of hole

t_2 height of cutting zone of hole

t_3 height of breakaway zone of hole

t_4 height of burr on hole

t plate thickness

w_b hole size, measured on reverse (burr) side

Fig. 6 Cross-Section of Industrial Perforated Plates Screen

5.8.2 *Burrs on Holes and Shearing Burrs*

Burrs will occur during both the perforating and the cutting (shearing) operations.

While burrs on holes occur on the reverse side of the plate only, shearing burrs may occur on either the punch side or the reverse side, depending on the manufacturing procedure adopted.

Not more than 10 percent of the number of holes or 10 percent of the length of a cut edge of an industrial perforated plates screen shall have burr heights in excess of the values stated in Table 7 (*see* Fig. 6). Measure the burr on holes with a depth micrometer and the shearing burrs with a vernier calliper.

5.8.3 *Missing Holes*

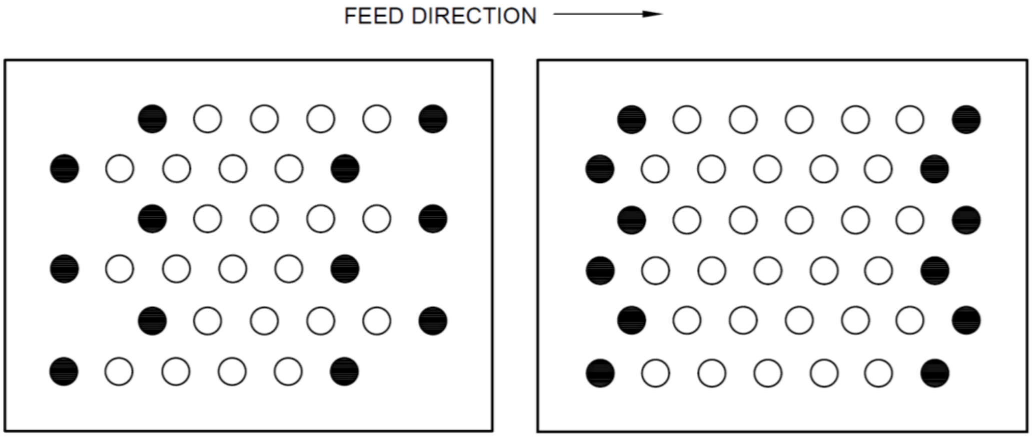
The number of holes missed for punching shall not exceed 5 percent of the total number of holes in an industrial perforated plates screen (*see* Fig. 7).

Table 7 Maximum Height of Burr

(*Clause* 5.8.2)

All dimensions in millimetres.

Sl No.	Nominal Plate Thickness, t	Maximum Height of Burr, t_4
(1)	(2)	(3)
i)	$t \leq 0.6$	0.15
ii)	$0.6 < t \leq 1.5$	0.17
iii)	$1.5 < t \leq 3$	0.2
iv)	$3 < t \leq 6$	0.28
v)	$6 < t \leq 10$	0.5
vi)	$10 < t \leq 12.5$	0.75



7 A DOUBLE STAGGERED PUNCHES GIVING INCOMPLETE FIRST AND LAST ROWS

7 B SINGLE STAGGERED PUNCHES GIVING COMPLETE ROWS

(The positions of the punches in the tool are shown in black)

FIG. 7 PATTERNS OF PERFORATIONS CAUSED BY DIFFERENT TOOL ARRANGEMENTS

6 DESIGNATION OF INDUSTRIAL PERFORATED PLATE SCREEN

Designation of the perforated plate screens shall comprise the following detail with word ‘perforated screen’:

a) Shape of holes (square holes or round holes);
b) Aperture size, w in mm;
c) Arrangement of holes (*see* **4.3**);
d) Patch/aperture ratio; and
e) Material of perforated plate screen.

Example:

For steel plate industrial perforated plate screen having an aperture size of 56 mm of round hole of 60° staggered with pitch aperture ratio of 1.25, the designation shall be:

[perforated screen, $w - 56\,\text{mm}, p/w$ 1.25, round, steel]

7 DELIVERY

The industrial perforated plate screen may be delivered as plate or coil.

8 INFORMATION TO BE SUPPLIED BY THE PURCHASER

The purchaser should state the following with any enquiry and order:

a) designation of the industrial perforated plate screen;
b) industrial perforated plate screen material with all its technical details such as grade/class/types/finish, as per relevant Indian Standards;
c) arrangement of aperture;
d) patch/aperture ratio;
e) the length and width of industrial perforated plate screen;
f) particular of margin;
g) thickness of plate; and
h) any other information, if required.

9 MARKING

9.1 The industrial perforated plate screen shall have marked or attached label or tag on which the following information shall be legibly and indelibly marked:

a) manufacturer’s name or trade-mark;
b) designation of industrial perforated plate screen;
c) overall dimensions of industrial perforated plate screen;
d) industrial perforated plate screen material with all its technical details such as grade/class/types/finish, as per relevant Indian Standards;
e) batch number or date of manufacture;
f) particulars of margin, if required; and
g) any other information, if required.

9.2 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the product(s) may be marked with the Standard Mark.

ANNEX A

(*Clause* 5.1)

NOMINAL SIZES OF OPENINGS — MILLIMETRE SIZES

Principal Sizes	*Supplementary Sizes*	
R 10	R 20	R 40
125	125	125
		118
	112	112
		106
100	100	100
		95
	90	90
		85
80	80	80
		75
	71	71
		67
63	63	63
		60
	56	56
		53
50	50	50
		47.5
	45	45
		42.5
40	40	40
		37.5
	35.5	35.5
		33.5
31.5	31.5	31.5
		30
	28	28
		26.5
25	25	25
		23.6
	22.4	22.4
		21.2
20	20	20
		19
	18	18
		17
16	16	16
		15
	14	14
		13.2
12.5	12.5	12.5
		11.8
	11.2	11.2
		10.6
10	10	10
		9.5
	9	9
		8.5
8	8	8
		7.5
	7.1	7.1
		6.7

Principal Sizes	*Supplementary Sizes*	
R 10	R 20	R 40
6.3	6.3	6.3
		6
	5.6	5.6
		5.3
5	5	5
		4.75
	4.5	4.5
		4.25
4	4	4
		3.75
	3.55	3.55
		3.35
3.15	3.15	3.15
		3
	2.8	2.8
		2.65
2.5	2.5	2.5
		2.36
	2.24	2.24
		2.12
2	2	2
		1.9
	1.8	1.8
		1.7
1.6	1.6	1.6
		1.5
	1.4	1.4
		1.32
1.25	1.25	1.25
		1.18
		1.12
		1.06
1	1	1

ANNEX B

(*Clauses* 5.1, 5.2, 5.5.2 *and* 5.6)

TEST METHODS

B-1 APERTURE SIZE AND PITCH

The minimum number of holes to be considered in order to arrive average aperture width or average pitch shall be as per Table 8. Where the minimum number of holes prescribed for examination in one or two directions is not available in the plate, all the holes in the screen shall be checked. Measurement of size or hole and pitch in perforated plate shall be made at the punch side of the plate. Measure the dimensions of holes and pitches, over any selected plate area, along two straight lines and in different directions. Measure the hole size on the centre line of the square holes and on the diameter of the round holes. For measuring holes, plain plug gauge is used.

B-2 PLATE WIDTH AND LENGTH

Measure the plate width and length with a scale graduated in millimetres. For dimensions of 300 mm or less, vernier callipers may be employed. Take the measurement over the entire thickness *t* (*see* Fig. 4).

B-3 SQUARENESS

Determine the squareness of industrial perforated plate screen by measuring the plate width and length and the amount out-of-square *c* according to **5.6**. Identify the dimension *c* with the aid of a try square.

Table 8 Minimum Number of Holes to be Measured

(*Clause* B-1)

Sl No.	**Nominal Sizes of Holes,** *w* mm	**Number of Holes to be Measured**
(1)	(2)	(3)
i)	Over 16 mm up to 125 mm	2 × 5
ii)	Over 4 mm up to 16 mm	2 × 10
iii)	Upto 4 mm	2 × 20

NOTE — Explanation: 2 x 5 means five holes to be measured in both directions

ANNEX C

(*Foreword*)

COMMITTEE COMPOSITION

Sieves, Sieving and Other Sizing Methods Sectional Committee, CED 55

Organization	*Representative(s)*
In Personal Capacity (*90, Savita Vihar, Vikas Marg, Delhi - 110092*)	Dr R. P. Singhal **(*Chairperson*)**
AIMIL Limited, New Delhi	Shri Rohitash Barua Shri Madan Kumar Sharma (*Alternate*)
Associated Soapstone Distributing Co Private Limited, Jaipur	Shri Vikram Golcha Shri Dilip Jha (*Alternate*)
Cement Corporation of India Limited, New Delhi	Shrimati Saraswathi Devi Shri Anurag Kumar Saini (*Alternate*)
Central Public Works Department, New Delhi	Shri Vinayak Rai Shri Divakar Agrawal (*Alternate*)
Central Soil & Materials Research Station, New Delhi Roorkee	Shri Amardeep Singh Shri B. K. Munzni (*Alternate*)
CSIR - Central Building Research Institute,	Shri A. K. Sharma Dr Pradeep Kumar (*Alternate*)
CSIR - National Physical Laboratory, New Delhi	Dr Sanjay Yadav Dr Nita Dilawar (*Alternate*)
Haver Standard India Private Limited, Mumbai	Shri Deven H. Shah Shri Vikram D. Shah (*Alternate*)
Indian Bureau of Mines, Nagpur	Shri M. G. Raut Shri V. A. Sontakkey (*Alternate*)
Indian Institute of Technology, Delhi, New Delhi	Representative
Industrial Wire Netting Company, New Delhi	Shri Keshav Gupta Shri Sanjay Gupta (*Alternate*)
Military Engineer Services, Engineer-in-Chief's Branch, Integrated HQ of Ministry of Defence, New Delhi	Shri P. K. Jain Shri Somesh Kumar (*Alternate*)
National Council for Cement and Building Materials, Faridabad	Shri Suresh Kumar Shri G. J. Naidu (*Alternate*)
National Mineral Development Corporation Limited, Hyderabad	Shri S. K. Sharma Shri G. V. Rao (*Alternate*)
National Test House, Kolkata	Shri Vivek Sharma Shrimati Maymole Boben (*Alternate*)
Steel Authority of India Limited, Kolkata	Shri Bipin Kumar Giri Shri Sibabrata Basak (*Alternate*)

Organization	*Representative(s)*
Ultratech Cement Limited, Mumbai	SHRI DINESH CHANDRAN K. P. SHRI DEVENDRA PANDEY (*Alternate*)
In Personal Capacity (*B-129, F-2, Ramprastha Colony, Ghaziabad - 201011*)	SHRI VIRENDRA BABU
In Personal Capacity (*Indian Institute of Technology, Hauz Khas, New Delhi - 110016*)	PROF B. PITCHUMANI
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